REMARKS/ARGUMENTS

Claims 24-25 are withdrawn from further consideration. Claims 1-23 remain pending in this application, and Applicants request the Examiner's reconsideration of this application in view of these remarks and arguments.

Applicants first acknowledge that the Examiner has allowed Claims 20-23. Moreover, the Examiner has objected to Claims 5-10 and 15-19 stating that they are each dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants have not amended these objected to claims because it remains Applicant' view, based on the detailed arguments below, that the independent claims (i.e., Claims 1 and 11) from which the objected to claims (i.e., Claims 5-10 and 15-19) depend, respectively, are themselves allowable.

Embodiments of the invention recited in Claims 1-4 and 11-14, in general, describe methods (performed in a receiver that is processing an input signal transmitted from a transmitter in a multi-carrier communication system) for determining a frequency error and a timing synchronization error (specification at page 12, lines 20-22 and page 18, lines 28-30). The frequency error is determined with respect to at least one frequency search space comprising a plurality of frequency offsets (specification at page 12, lines 24-26), and the timing synchronization error is determined with respect to at least one timing search space comprising a plurality of timing offsets (specification at page 19, lines 2-4). Regarding the frequency error: a first noise estimation is calculated for a first frequency offset in the frequency search space; at least a second noise estimate is calculated for a second frequency offset in the frequency search space; and a minimum noise estimation is determined from all of the calculated noise estimations. The frequency error is the frequency offset that corresponds to the minimum noise estimation (specification at page 13, lines 3-16). Regarding the timing synchronization error: a first noise estimation is calculated for a first timing offset in the timing search space; at least a second noise estimate is calculated for a second timing offset in the timing search space; and a

minimum noise estimation is determined from all of the calculated noise estimations. The timing error is the timing offset that corresponds to the minimum noise estimation (specification at page 19, lines 10-15 and 28-30 and page 20 at line 1).

The Examiner has rejected Claims 1-4 and 11-14 under 35 U.S.C. 102(b) as being anticipated by Maalej, et al. (USPN 6,249,180). Applicants respectfully traverse these rejections.

MPEP § 2131 provides:

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F. 2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim ....

Applicants submit that Maalej fails to disclose each and every element recited in Claim 1 (directed to a method for determining a frequency error) and in Claim 11 (directed to a method for determining a timing synchronization error). Therefore, the Examiner's reliance upon Maalej appears to be misplaced. It should be further noted that the Examiner deals with both independent claims concurrently in the final office action dated December 8, 2005 on page 2. However as detailed below, different portions of the relevant circuit 99 disclosed in Maalej deal respectively with frequency error determination and timing error determination, which necessitates separately discussing the patentability of Claims 1 and 11 in view of this reference.

Described by Maalej is a "QAM demodulator circuit 99 . . . typically [] used as part of a Network Interface Unit" (FIG. 1; col. 3, lines 65-67). The QAM demodulator circuit 99 receives an "IF [intermediate frequency] signal . . . and convert[s] the IF signal to a baseband signal" (FIG. 2; col. 4, lines 23-31) using a direct digital synthesis (DDS) 30 (FIG. 2). The baseband signal is then further processed by a timing recovery circuit 35, a digital automatic gain control (AGC) circuit 20, a filter 40, an equalizer 45, a carrier

recovery circuit 50 and a symbol decision circuit 55 to produce a recovered bit stream 57 from the input IF signal (FIG. 2; col. 4, line 35 to col. 5, line 13). The recovered bit stream 57 is further processed in a Forward Error Correction (FEC) circuit 60 to generate "MPEG2 Transport System (TS) packets [that] is the output of the demodulator 99" (FIG. 2; col. 5, lines 30-33).

Turning first to the patentability of Claim 1 in view of Maalej, Maalej discloses that the DDS 30 performs frequency recovery for the IF signal. Related to such frequency recovery, demodulator 99 further monitors a frequency error (offset) Δf (527) that is determined by a frequency offset detect circuit 525 in the carrier recovery circuit 50. The frequency error is used by DDS 30 "to recover the frequency with complete accuracy" (FIG. 2, col. 6, lines 51-53 and 59-61). Maalej is silent on the details regarding exactly how the frequency error is determined by the frequency offset detect circuit 525 but merely states that "circuit 50 allows the acquisition and tracking of a frequency offset (error) as high as 12 percent of the symbol rate" (col. 4, line 66 to col. 5, line 1). As Maalej is silent about how it's disclosed system calculates the frequency error, it follows that Maalej does not disclose

determination including the specific methodology for frequency error determination recited in Claim 1, namely, recited in the limitations "calculating a first noise estimation for a first frequency offset in a frequency search space; . . . calculating at least a second noise estimation for a second frequency offset in said frequency search space; and . . . determining a minimum noise estimation from said calculated noise estimations, wherein said frequency error is the frequency offset corresponding to said minimum noise estimation".

Turning next to the patentability of Claim 11 in view of Maalej, Maalej discloses "a timing recovery circuit 35 which is used to synchronize the timing of the demodulator circuit to the symbols of the incoming symbols" (col. 4, lines 37-39). The timing recovery circuit 35 includes a timing error detector 354 (FIG. 7). Similar to the frequency error timing circuit 525 described above, Maalej is likewise silent on the details regarding exactly how the timing error is determined by the timing error detector 354. As Maalej is silent about how it's disclosed system calculates the timing error, it follows that Maalej does not disclose any method for timing error determination

including the specific methodology for timing error determination recited in Claim 11, namely, recited in the limitations "calculating a first noise estimation for a first timing offset in a timing search space; . . . calculating at least a second noise estimation for a second timing offset in said timing search space; and . . . determining a minimum noise estimation from said calculated noise estimations, wherein said timing error is the timing offset corresponding to said minimum noise estimation".

In light of Applicants' argument above, it is easy to see that the Examiner's citations to Maalej are taken out of context and clearly do not read on the limitations recited in Claims 1 and 11 as the Examiner argues in the final office action dated December 8, 2005 on page 2. The Examiner states "With respect to Claims 1 and 11, Maalej discloses a method for determining a frequency/timing error (Column 5: Lines 2-4)/(Column 4: Lines 38-39) over at least one frequency/timing search space for a received signal (Column 2, lines 25-27), the method comprising the steps of: a) calculating a first noise estimation (Column 7: lines 1-4) for a first frequency/timing offset (Column 6: Line 52) in a frequency/timing search space; b) calculating at least a second noise estimation for a second frequency/timing offset in said frequency/timing search space (Column 2: Lines 25-27); and c) determining a minimum noise estimation from said calculated noise estimations, wherein said frequency/timing error is the frequency/timing offset corresponding to said minimum noise estimation (Column 9: Lines 15-25, 34-41)."

Following is a discussion of each of the Examiner's citations and why they do not disclose the limitations recited in Claims 1 and 11. Maalej in col. 5, lines 2-4 discloses "This information can be used to readjust the tuner of the demodulator frequency in order to reduce the filtering degradation of the signal". As further disclosed in col. 5, line 1 "this information" referred to in the Examiner's citation is the frequency error (offset) described above. As one can see, the passage cited by the Examiner does not disclose the limitations recited in Claim 1 of "a ***method*** for determining a frequency error" it merely identifies that a frequency error is calculated and how the frequency effort is used, but as Applicants argued above no method for actually determining this frequency error is disclosed in Maalej.

Maalej in col. 4, lines 38-39 discloses "timing recovery circuit 35 which is used to synchronize the timing of the demodulator circuit to the symbols of the incoming signals". As one can see, the passage cited by the Examiner does not disclose the limitations recited in Claim 11 of "a *method* for determining a timing synchronization error" it merely identifies that the Maalej system includes a timing recovery circuit and how that circuit is used, but as Applicants argued above no method for actually determining a timing error is disclosed in Maalej.

Maalej in col. 2, lines 25-27 discloses "additive gaussian white noise, is random noise that has a frequency spectrum that is continuous and uniform over a specified frequency band". As one can see, this cited language merely defines Gaussian white noise and does not disclose the limitations in Claims 1 and 11 which the Examiner argues are anticipated by this language, namely the limitations of "at least one frequency/timing search space for a received signal" over which a frequency and timing error are determined and the limitations of "in a frequency timing/timing search space; b) calculating at least a second noise estimation for a second frequency/timing offset in said frequency/timing search space".

Maalej in col. 7, lines 1-4 discloses "maintain the maximum signal energy before equalization and carrier frequency estimation, while the short loop carrier phase recovery is optimal for phase tracking, especially in case of phase noise on the signal". This is a partial quote of the language in Maalej that when read in the context of prior text in col. 6, lines 63-67, describes why "employing a dual DDS structure [comprising a long loop frequency down-conversion and a short loop carrier phase recovery] to control the down conversion of the IF signal to a baseband signal is advantageous". This citation merely mentions the possible existence of phase noise on a signal but does not disclose actually calculating a phase noise (or any other noise) estimation. Accordingly, this citation does not disclose the limitations in Claims 1 and 11 which the Examiner argues are anticipated by this language, namely the limitations of "the method comprising the steps of: a) calculating a first noise estimation".

Finally, Maalej in col. 9, lines 15-25 and 34-41 describes a phase noise estimation circuit 506 and an additive noise 507 estimation circuit. The reference states that to determine these two separate noise estimates, which are independent of each other

(Abstract), the carrier recovery circuit 50 first determines a "Least Mean Square (LMS) error between the decided QAM symbol 509 and the received QAM symbol 504 . . . by the LMS error method 505 as known in the art and the LMS error signal 512 is supplied with the decided QAM symbol 509 to each of the phase noise 506 and additive noise 507 estimators." (col. 9, lines 20-25). Maalej further states that the "phase noise estimation is based on the least mean square error . . . [and] the additive noise estimation is based on the same error signal 512 as in the phase noise estimation, but the error in the case of noise estimation is based only on QAM symbols having the minimum amplitude . . . on I and Q" (col. 9, lines 26-27 and 34-37). As one can see, the citation by the Examiner to col. 9 of Maalej has nothing at all to do with frequency error or timing error determination that is based on a minimum noise estimation of a plurality of noise estimation calculations. Accordingly, Maalej does not disclose the limitations in Claims 1 and 11 which the Examiner argues are anticipated by this language, namely the limitations of "c) determining a minimum noise estimation from said calculated noise estimations, wherein said frequency/timing error is the frequency/timing offset corresponding to said minimum noise estimation".

For all of the reasons above, Applicants submit that Maalej does not anticipate Claims 1-4 and 11-14 and ask that the Examiner remove the 102(b) rejections to these claims based on Maalej.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless Applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references.

The Applicants believe that the subject application is in condition for allowance. Such action is earnestly solicited by the Applicants.

In the event that the Examiner deems the present application non-allowable, it is requested that the Examiner telephone the Applicant's attorney or agent at the number indicated below so that the prosecution of the present case may be advanced by the clarification of any continuing rejection.

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Respectfully submitted,

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